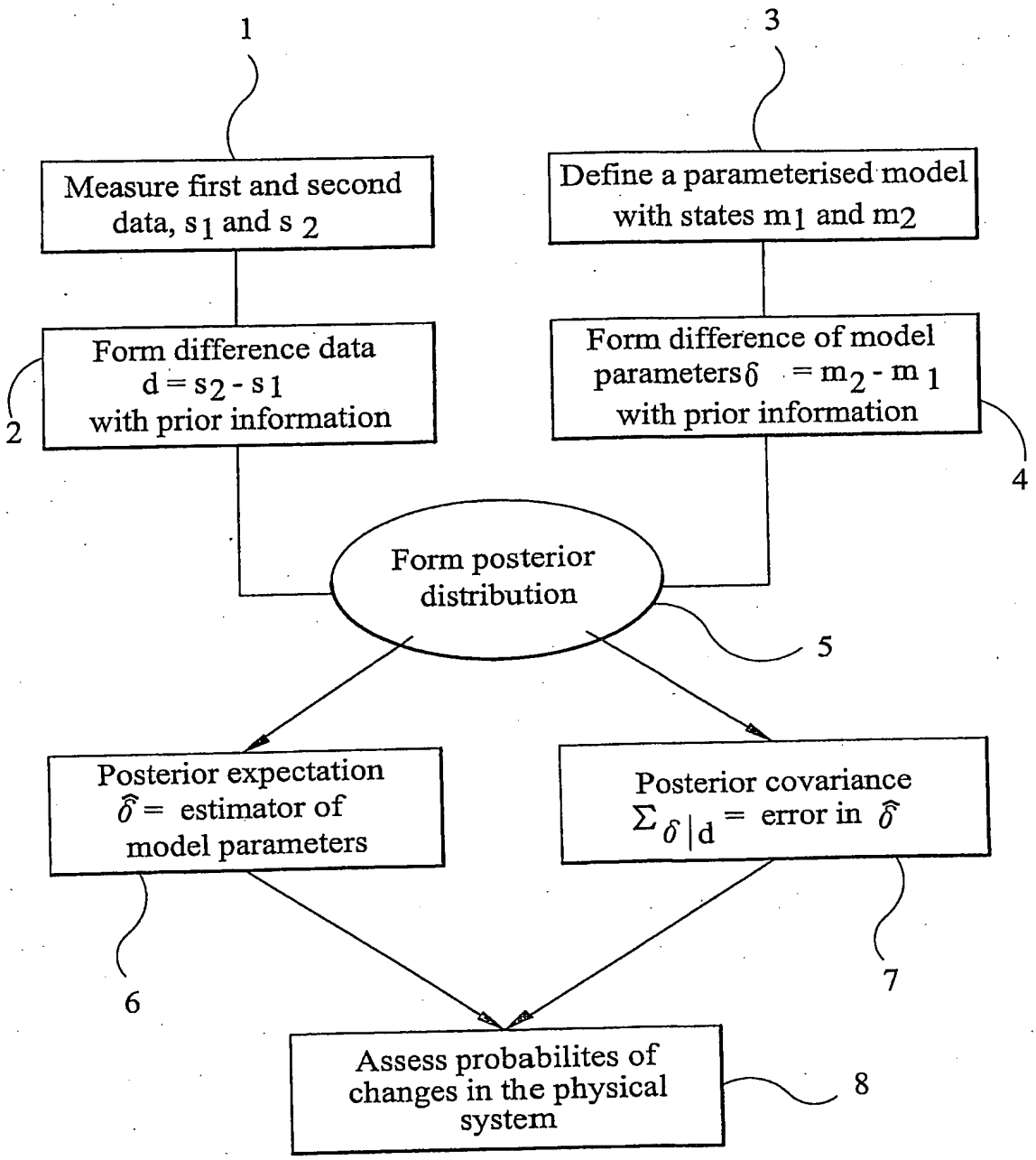
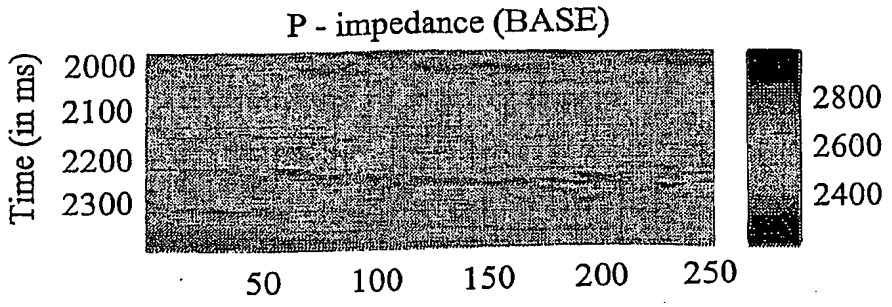
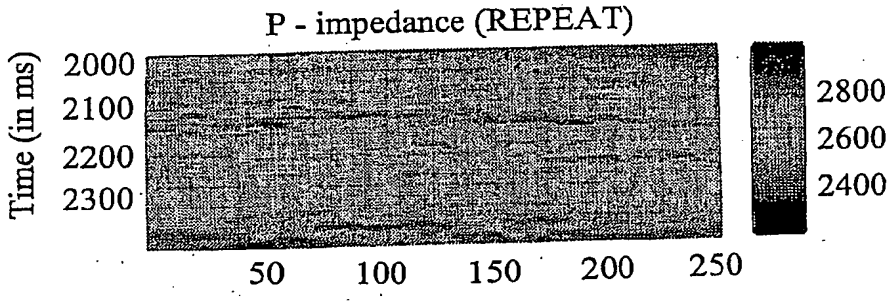

1
3
Measure first and second data, s1 and s 2
Define a parameterised model with states m1 and m2
Form difference data d = s2 - s1 with prior information
Form difference of model parameters δ = m2 - m 1 with prior information
2
4
Form posterior distribution
5
Posterior expectation δ̂ = estimator of model parameters
Posterior covariance Σδ|d = error in δ̂
6
7
Assess probabilites of changes in the physical system
8

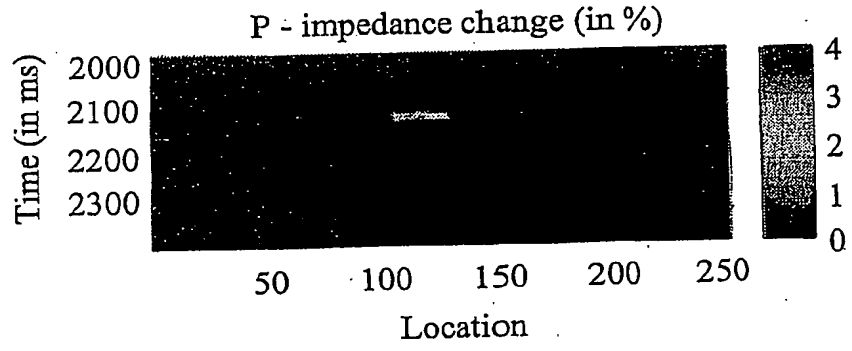
FIG 1


P - impedance (BASE)
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
2800
2600
2400

(a)


P - impedance (REPEAT)
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
2800
2600
2400

(b)


P - impedance change (in %)
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
Location
4
3
2
1
0

(c)

FIG 2

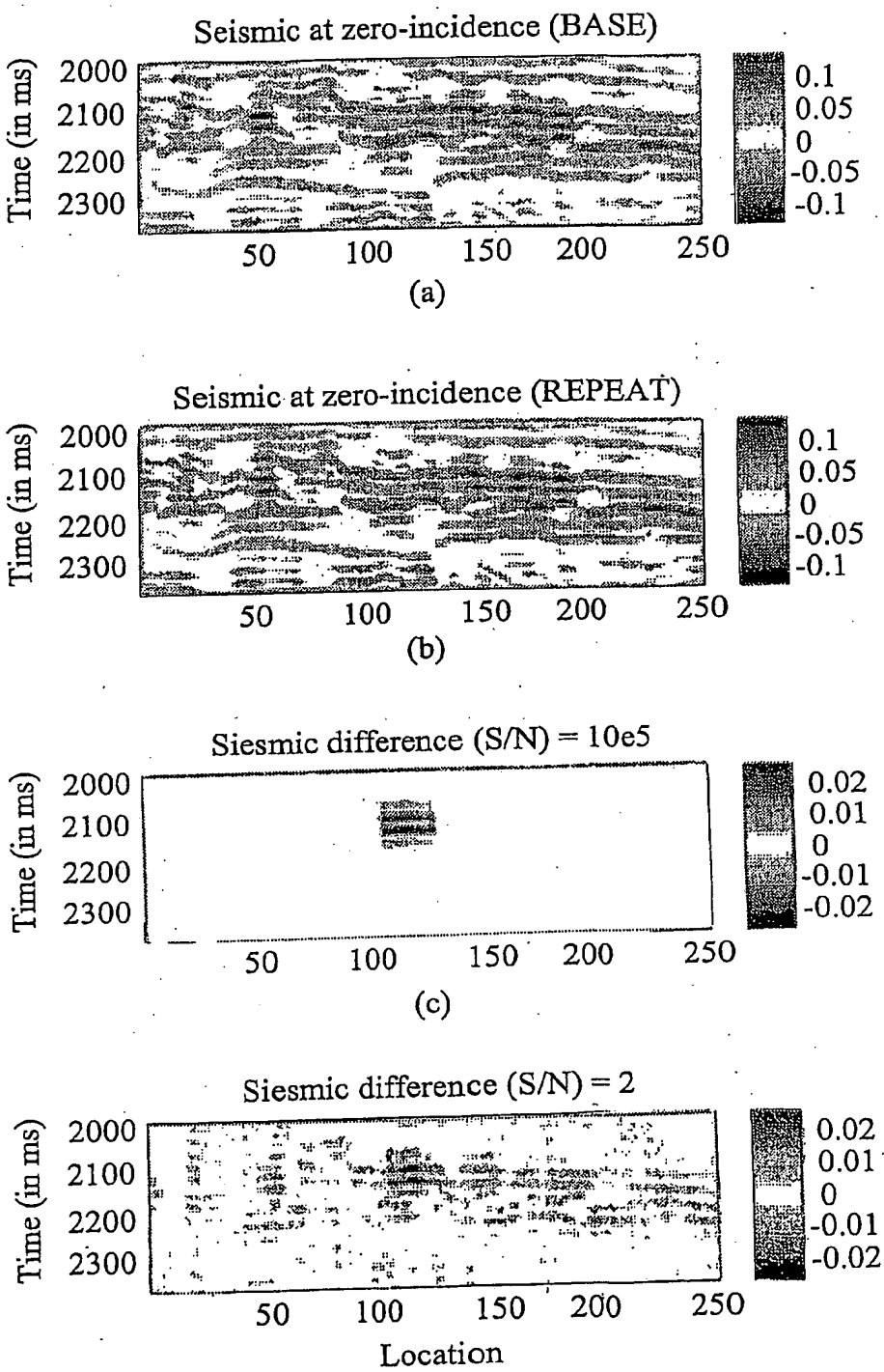
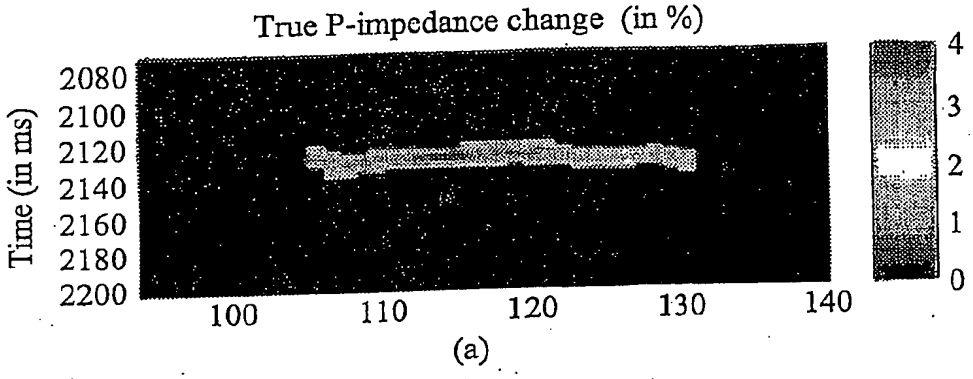
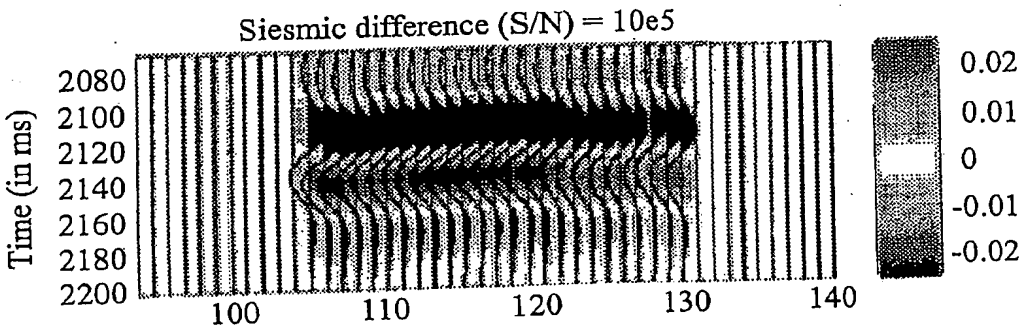

Seismic at zero-incidence (BASE)
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
0.1
0.05
0
-0.05
-0.1
(a)
Seismic at zero-incidence (REPEAT)
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
0.1
0.05
0
-0.05
-0.1
(b)
Siesmic difference (S/N) = 10e5
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
0.02
0.01
0
-0.01
-0.02
(c)
Siesmic difference (S/N) = 2
Time (in ms)
2000
2100
2200
2300
50
100
150
200
250
0.02
0.01
0
-0.01
-0.02
Location
(d)

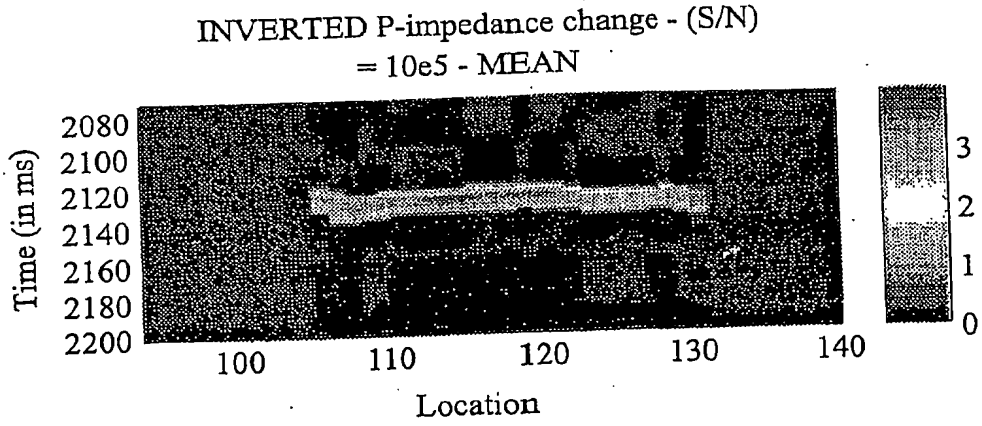
FIG 3


True P-impedance change (in %)
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
4
3
2
1
0

(a)

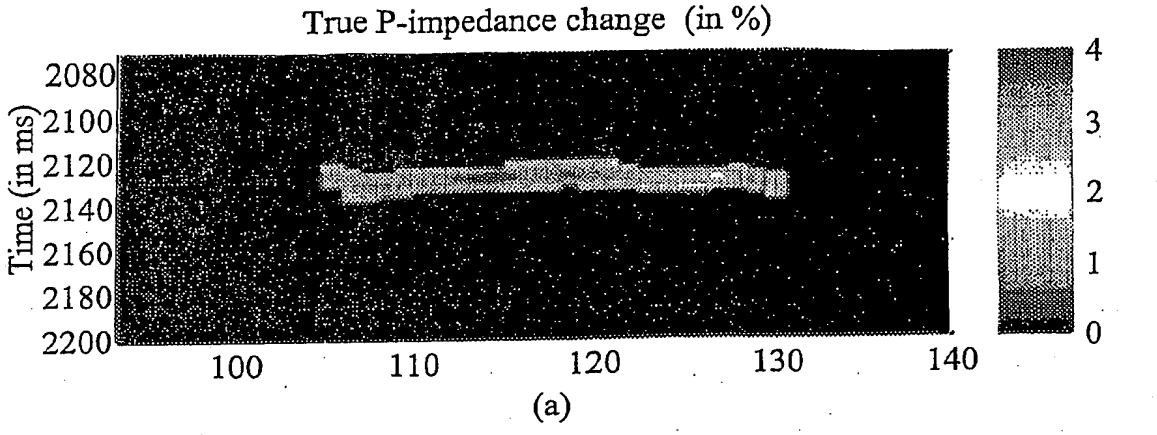

Siesmic difference (S/N) = 10e5
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
0.02
0.01
0
-0.01
-0.02

(b)

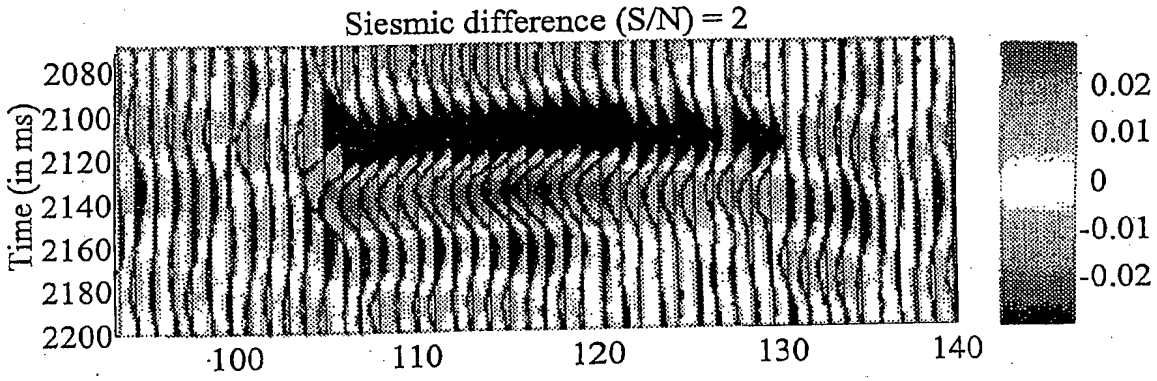

INVERTED P-impedance change - (S/N)
= 10e5 - MEAN
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
Location
3
2
1
0

(c)

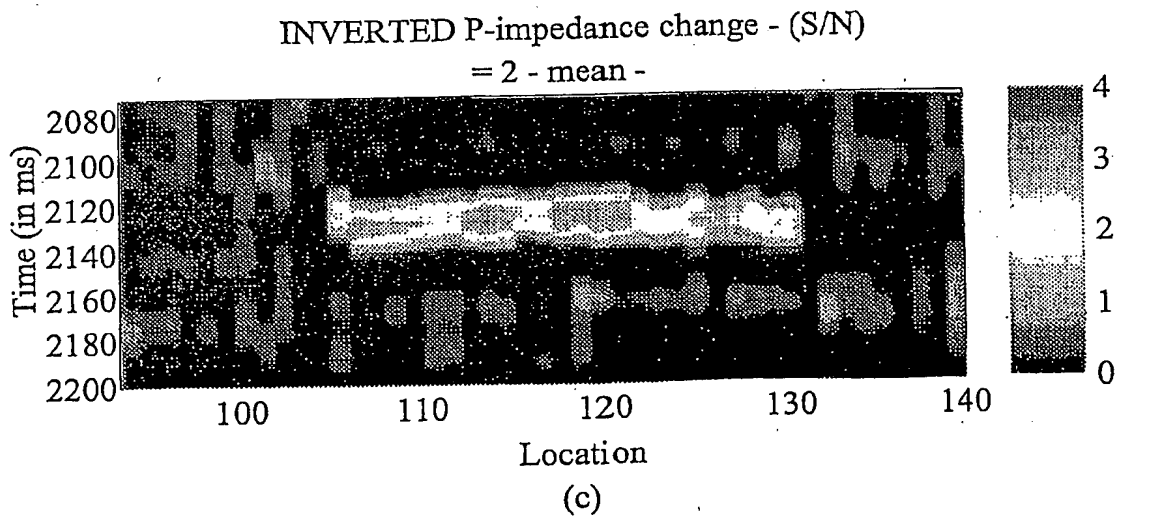
FIG 4


True P-impedance change (in %)
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
4
3
2
1
0

(a)

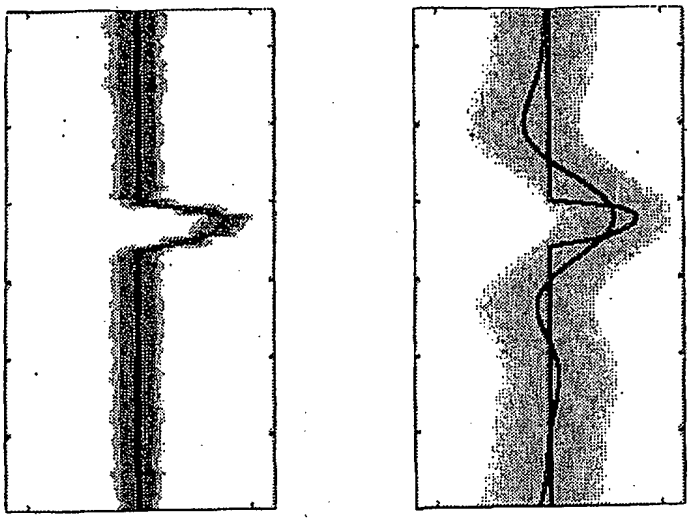

Siesmic difference (S/N) = 2
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
0.02
0.01
0
-0.01
-0.02

(b)


INVERTED P-impedance change - (S/N)
= 2 - mean -
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
Location
4
3
2
1
0

(c)

FIG 5



(a) (b)

FIG 6

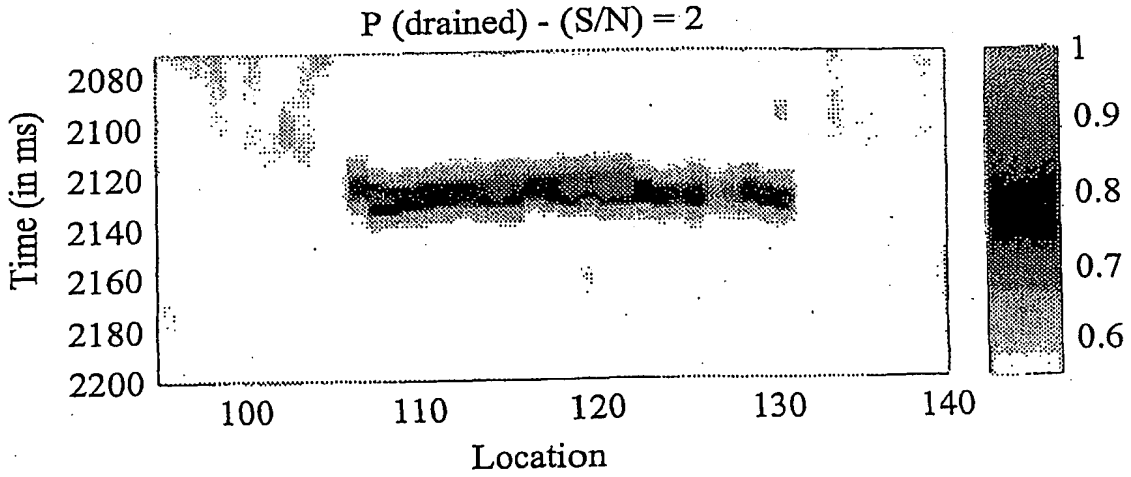

P (drained) - (S/N) = 2
Time (in ms)
2080
2100
2120
2140
2160
2180
2200
100
110
120
130
140
Location
1
0.9
0.8
0.7
0.6

FIG 7

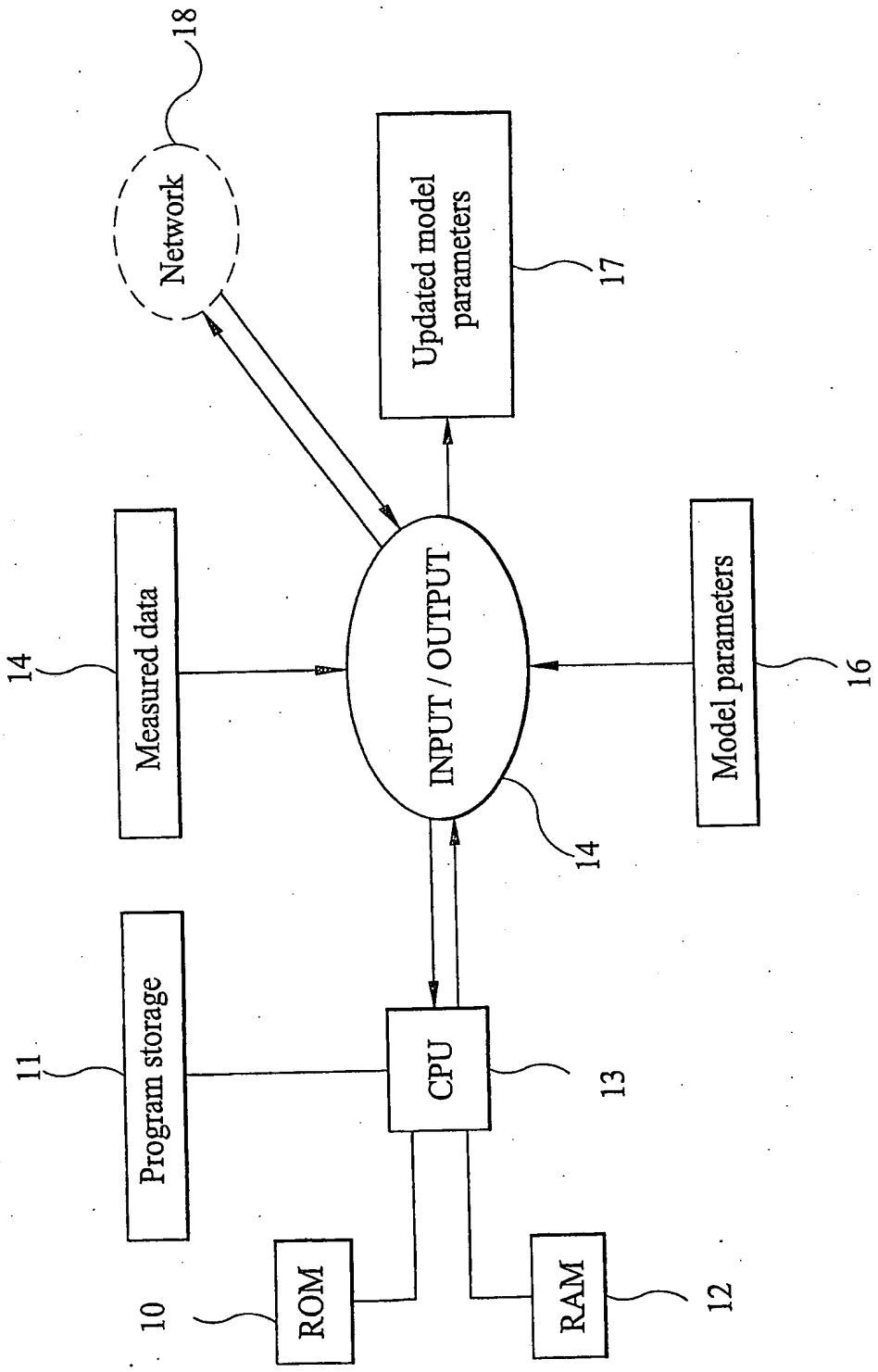

18
Network
Updated model parameters
17
Measured data
14
INPUT / OUTPUT
Model parameters
16
14
Program storage
11
CPU
13
ROM
10
RAM
12

FIG 8